Quantification of the feedback between phytoplankton and ENSO

Jochum, Yeager, Lindsay, Moore & Murtugudde

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Annual mean surface chlorophyll

**obs**

**low**

**high**

**highclim**

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**Color Legend**

- 2
- 1.3
- 0.6
- 0.55
- 0.5
- 0.45
- 0.4
- 0.35
- 0.3
- 0.25
- 0.2
- 0.15
- 0.1
- 0.05
- 0
Iron in the upper 150m

Low

High
ENSO with full BGC is 9% weaker than ENSO with identical but prescribed chlorophyll climatology (with 98.5 % significance).

This is true for the HIGH-set as well as the LOW-set.
The heat trapping effect of phytoplankton and its feedback with ENSO has been observed by Strutton & Chavez (1994). We quantified it for CCSM.

But why is it insensitive to the mean background values?
Difference in SST and precipitation between HIGH and LOW.
Standard deviation of thermocline depth

Correlation between NINO3 SST and zonal wind stress
Conclusions

- ignoring the ENSO-phytoplankton feedback in GCMs leads to a 9% overestimation of ENSO strength
- off-equatorial feedbacks are potentially important, but have not been well studied yet
- the amplitude of the phytoplankton feedback should also be established for other scenarios of interannual variability or trends (NAO, LGM, 21st century) ...
- ... and maybe a simplified mixed layer chlorophyll model should be added to CCSM